PCT/IL2004/000434

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Application for Patent

לשימוש הלשכה
For Office Use

מספר: Number	156202
תאריך: Date	
הוקדם/נדחה Ante/Post-dated	29-05-2003

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(באנגלית) (English)
IMPLANT HAVING INTEGRAL FLEXIBLE ABUTMENT PORTION AND METHOD FOR USE THEREOF

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* מבקשת פטנט from Application	* לבקשה / לפטנט To Patent/Appl.	מספר/סימן Number/Mark	תאריך Date	מדינת האיגוד Convention Country
מס' No.	מס' No.			
מיום Dated	מיום Dated			

* יפוי כח: כללי/מיוחד – רצוף בזה / עוד יוגש
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IMPLANT HAVING INTEGRAL FLEXIBLE ABUTMENT PORTION AND METHOD FOR USE THEREOF

FIELD OF THE INVENTION

The present invention relates to the field of bone implants. More particularly, the present invention relates to an implant having an integral abutment portion for facilitating connection of a prosthesis to said implant, and to a method for implanting said implant into a bone of the body.

BACKGROUND OF THE INVENTION

A dental implant is a device that is surgically attached to a patient's jawbone in order to replace one or more missing teeth. A typical dental implant includes an implant fixture that the surgeon inserts into the jawbone, and a prosthesis, which replaces at least a portion of a missing tooth. Currently, the most prevalent type of dental implant fixture is a root-form implant. As its name suggests, the root-form implant has an elongated shape reminiscent of the bone portion of a tooth. Much like roots of natural teeth, the root-form implant penetrates the gum and anchors the prosthesis to the jawbone.

The dental implant assembly also includes an abutment, which provides an interface or transition between the implant fixture and the prosthesis. Conventional abutments typically include a substantially axisymmetric base portion, which fits into a hole formed in the implant fixture, and a conical neck portion, which projects outward from the base portion of the abutment. Besides securing the prosthesis to the implant fixture, the abutment also compensates for misalignment between the prosthesis and adjacent teeth. Misalignment can arise, for example, when the implant fixture has an orientation with respect to the gum surface that is substantially different than the adjacent teeth.

Implant assemblies employ angled abutments, as opposed to straight abutments, to account for any misalignment. Straight and angled abutments have neck portions that project outward from their base portions in directions that are, respectively, substantially parallel or non-parallel to the symmetry axes of their corresponding base portions. Therefore, if the direction or orientation of the neck portion of the abutment is represented by a longitudinal axis that intersects the symmetry axis of the base portion (or implant fixture), the resulting orientation angle is about zero for straight abutments. In

contrast, an angled abutment exhibits a non-zero orientation angle. For a discussion of straight and angled abutments, see U.S. Pat. No. 5,947,733 issued to Franz Sutter et al., which is herein incorporated by reference in its entirety for all purposes.

Though widely accepted by dental practitioners, dental implants generally, and root-form implants in particular, can be problematic. For example, the neck portions of commercially available angled abutments have fixed angular displacements with respect to their base portions, which limits their usefulness. Once a patient has been fitted with an implant fixture, the dental practitioner must order an abutment having the requisite orientation angle to ensure proper alignment of the prosthesis. However, since only discrete orientation angles are available, it is often necessary to modify the abutment to achieve the requisite angular orientation, which can be a labor intensive and costly. In some cases the necessary orientation angle may be significantly greater than what is commercially available, making it difficult to attain acceptable alignment of the prosthesis.

Dental implants having adjustable orientation angles are known, but none appear to have achieved widespread use because of design deficiencies. See, for example, U.S. Pat. No. 6,500,003 issued to Nichinonni; U.S. Pat. No. 5,890,902 issued to Sapian; U.S. Pat. No. 5,662,475 issued to Mena; U.S. Pat. No. 5,599,185 issued to Greenburg; U.S. Pat. No. 5,302,125 issued to Kownacki et al.; U.S. Pat. No. 4,793,808 issued to Kirsch; and U.S. Pat. No. 4,832,601 issued to Linden, which are herein incorporated by reference in their entirety for all purposes. Most of the disclosed implants are limited to modest orientation angles of about twenty-five degrees or less, and many do not readily permit removal of the prosthesis following installation. Some of the disclosed implants also fail to provide a smooth transition between the prosthesis and the implant fixture, which results in poor soft tissue adaptation. To ensure accurate alignment of the prosthesis with adjacent teeth, current practice provides for fabricating an abutment and prosthesis from a cast of the patient's mouth following insertion of the implant fixture. Some of the disclosed designs, however, do not include a mechanism for attaching the prosthesis to the abutment prior to installation, and therefore cannot take advantage of using a laboratory cast, if desired.

Additionally, root-form implant designs known in the art have had a high failure rate, especially with patients with Type IV bone, and for certain types of bone resorption.

SUMMARY OF THE INVENTION

It is thus the object of the present invention to provide a dental implant having an integral abutment portion that overcomes all of the disadvantages of the prior art. The implant of the present invention has an abutment portion that is integrally formed with the implant. This is in contrast to all known dental abutments of the prior art, which, to the knowledge of the inventors, have always been a separate component from the implant itself. Moreover, as it will be appreciated further, the construction of the dental implant of the present invention allows for the surgeon to easily manipulate the angular orientation of the abutment portion to any needed spatial configuration. Additional advantages of the present invention include the universality of the design, which obviates the need for the manufacturing of numerous sizes of implants. Also, the method for using the dental implant of the present invention requires a relatively narrow and shorter drilling channel, thus avoiding potential complications which may arise. It will be further appreciated that the implant of the present invention could be readily adapted for use in other bones of the body, in addition to the jawbone. It will also be appreciated that the implant of the present invention is the first implant system which can be easily used on a moist area. Previously, many difficulties were encountered when trying to implant prosthetic devices onto wet bone surfaces.

The present invention relates to an implant having an integral anchoring portion for being implanted into a bone of the body comprising;

(a) a bone portion for being inserted into a bone of the body;

(b) an anchoring portion attached to said bone portion, said anchoring portion having a bendable neck region comprising a bellow-type construction;

wherein said implant further comprises an inner hollow cavity that extends through said bone portion and said anchoring portion.

According to preferred embodiments of the present invention, the bone portion has an outer surface, wherein said outer surface is non-smooth, for providing a scaffold for bone integration. In one preferred embodiment, the bone portion has a plurality of external threads located on said outer surface. In other preferred embodiments, the bone portion has a plurality of slots located on said outer surface and extending around the outer circumference thereof. It is appreciated that other designs are also possible for increasing the outer surface area of the bone portion. Further according to preferred embodiments of the present invention, the bone portion has a plurality of holes extending from the outer surface to the inner hollow cavity. These holes may have any appropriate size. As it will be described further, the holes allow for the mixing of polymer compositions located on the exterior and interior of the implant.

Still further according to preferred embodiments of the present invention, the anchoring portion further comprises a connector portion adapted in construction for enabling fixation of a prosthesis onto the anchoring portion. Any acceptable means known in the art may be employed for allowing mounting of the prosthesis onto the anchoring portion. In one preferred embodiment, the connector portion has a threaded internal bore for allowing connection via a screw. A ball-and-socket joint may also be employed in other embodiments. Any suitable connection may be used.

Still further according to preferred embodiments of the present invention, the bendable neck region comprises an outer surface, said outer surface comprising plurality of grooves. Preferably, the grooves are rectangular shaped, though they may have other appropriate shape as well. It is appreciated that any suitable construction may be employed for enabling the neck region to be bendable in a bellow-type or (drinking) straw-like manner. In the preferred embodiment having grooves, said grooves extend to less then half of the outer circumference of the bendable neck region.

The implant may be comprised of any suitable biocompatible FDA-approved dental implant material or composite of materials. For example, the implant may be formed from stainless steel. In one embodiment, the implant is comprised of nitinol. Preferably,

the bendable neck region is comprised of flexible stainless steel or a suitable polymeric composition. In some preferred embodiments, the implant may be formed from a material having "shape memory", as are known in the art.

Preferably, the bendable neck region of the anchoring portion is adapted for being adjusted between to angles between 0-25 degrees with respect to the central vertical axis of said neck region.

According to preferred embodiments of the present invention, the bendable neck region is comprised of flexible stainless steel.

Additionally according to preferred embodiments of the present invention, the implant further comprises at least one drug incorporated therein. The drug may be selected from, for example, anti-inflammatory agents, antibacterial agents, antimycotic agents, antibiotics, and bone-regrowth stimulants.

The implant of the present invention can be useful for surgeries performed all bone of the body, and thus can greatly improve the overall efficiency and ease of performance of such surgeries. This includes, for example, procedures performed on the jawbone, the hipbone, the spinal column, the shoulder bone, facial bone, cranial bones, and the knee.

The present invention relates to a dental implant having an integral abutment comprising;

(a) a bone portion;

(b) an abutment portion having a bendable neck region attached to said bone portion, said bendable neck region having a plurality of bellows (throughout the present disclosure, when referring specifically to the preferred embodiment of the dental abutment, the "anchoring portion" of the implant is called the "abutment portion", since this is the accepted term used by dental surgeons);

wherein the dental implant further comprises an inner hollow cavity that extends through the bone portion and the abutment portion.

According to preferred embodiments of the present invention, the bone portion has an outer surface, wherein said outer surface is non-smooth, for providing a scaffold for bone integration. In one preferred embodiment, the bone portion has a plurality of external threads located on said outer surface. In other preferred embodiments, the bone portion has a plurality of slots located on said outer surface and extending around the outer circumference thereof. It is appreciated that other designs are also possible for increasing the outer surface area of the bone portion.

Further according to preferred embodiments of the present invention, the bone portion has a plurality of holes extending from the outer surface to the inner hollow cavity. These holes may have any appropriate size. As it will be described further, the holes allow for the mixing of polymer compositions located on the exterior and interior of the implant.

Still further according to preferred embodiments of the present invention, the abutment portion further comprises a connector portion adapted in construction for enabling fixation of a dental prosthesis onto the abutment portion. Any acceptable means known in the art may be employed for allowing mounting of the prosthesis onto the abutment. In one preferred embodiment, the connector portion has a threaded internal bore for allowing connection via a screw. A ball-and-socket joint may also be employed in other embodiments. Any suitable connection may be used.

Additionally according to preferred embodiments of the present invention, the implant further comprises a healing cap. Said healing caps are well known in the art and serve to promote proper tissue growth around the prosthesis and the gum-line.

Moreover according to preferred embodiments of the present invention, the external diameter of the implant is approximately 3.20 millimeters.

Further according to preferred embodiments of the present invention, the implant has a total length of approximately 16-20 millimeters. Preferably, the bone portion has a length

of about 7 millimeters and the abutment portion has a length of about 9-12 millimeters. It will be appreciated that the implant used in the present invention is of a relatively short length, thus not contacting or putting pressure on sensitive nerve endings, which can lead to complications.

Still further according to preferred embodiments of the present invention, the bendable neck region comprises an outer surface, said outer surface comprising plurality of grooves. Preferably, the grooves are rectangular shaped, though they may have other appropriate shape as well. It is appreciated that any suitable construction may be employed for enabling the neck region to be bendable in a bellow-type or straw-like manner. In the preferred embodiment having grooves, said grooves extend to less then half of the outer circumference of the bendable neck region.

The dental implant may be comprised of any suitable biocompatible FDA-approved dental implant material or composite of materials. For example, the implant may be formed from stainless steel. In one embodiment, the dental implant is comprised of nitinol. Preferably, the bendable neck region is comprised of flexible stainless steel or a suitable polymeric composition. The bone portion is preferably formed from titanium.

Preferably, the bendable neck region is adapted for being adjusted between to angles between 0-25 degrees with respect to the central vertical axis of said neck region.

According to preferred embodiments of the present invention, the dental implant comprises at least one drug incorporated therein. Said drug may be selected from, for example, anti-inflammatory agents, antibacterial agents, antimycotic agents, antibiotics, gingival retraction agents, and bone regrowth stimulants, or any combinations thereof.

The present invention also relates to a method for performing dental implant surgery, using a dental implant having an integral abutment. The dental implant is comprised of a bone portion and an abutment portion having a bendable neck region attached to the bone portion. The bendable neck region has an accordion-type construction. The dental

implant further comprises an inner hollow cavity that extends through the bone portion and the abutment portion. The method comprises the steps of:

(a) forming a hole in the root of the mandible or maxilla bone of a patient;

(b) at least partially filling the root with a first polymeric, biocompatible, osteo-integrative composition;

(c) implanting the bone portion of the dental implant into the hole;

(d) bending the bendable neck region of the abutment portion of the dental implant so as to achieve the appropriate angular configuration;

(e) filling the inner hollow cavity with a second polymeric, biocompatible composition, and;

(f) affixing a temporary or permanent dental prosthesis to the dental implant.

Further according to preferred embodiments of the present invention, the step of affixing comprises affixing (for example, via screwing or gluing) the dental prosthesis into a threaded internal bore of the abutment portion. It is appreciated that any suitable connection may be employed between the prosthesis and the abutment.

Still further according to preferred embodiments of the present invention, the method also comprises allowing the first composition to enter and fill at least part of the inner hollow cavity of the dental implant. It is appreciated that the bone portion of the implant preferably has a non-smooth surface such that the first composition incorporates with the implant. In some embodiments, the bone portion comprises a plurality of holes such that said first composition is allowed to enter inside of the hollow cavity of the implant. It is appreciated that the use of the first and second polymeric compositions in the dental implant procedure facilitates the healthy incorporation of the implant into the bone, and the proper tissue ingrowth.

According to preferred embodiments of the present invention, the first polymeric composition is selected from the group consisting of: polylactic acid, polyglycolic acid, polyglactin, polydioxanone, polyglyconate, and all copolymers thereof. Additionally according to preferred embodiments of the present invention, the second polymeric

composition is selected from the group consisting of: polylactic acid, polyglycolic acid, polyglactin, polydioxanone, polyglyconate, and all copolymers thereof.

The present invention also relates to a method for performing implant surgery on a bone of the body, using an implant having an integral anchoring portion, said implant comprised of a bone portion and an anchoring portion having a bendable neck region attached to said bone portion, said bendable neck region having an bellow-type construction, wherein the implant further comprises an inner hollow cavity that extends through said bone portion and said anchoring portion, the method comprising the steps of;

(a) forming a hole in a bone of the body;
(b) at least partially filling said hole with a first polymeric, biocompatible composition;
(c) implanting the bone portion of the implant into said hole;
(d) bending the bendable neck region of the anchoring portion of the implant so as to achieve the appropriate angular configuration;
(e) filling the inner hollow cavity with a second polymeric, biocompatible, composition;
(f) affixing a medical device or prosthesis to the implant.

Additionally according to preferred embodiments of the present invention, the step of affixing comprises affixing the prosthesis into a threaded internal bore of the anchoring portion.

Preferably, the method of the present invention further comprises allowing the first composition to enter and fill at least part of the inner hollow cavity of the implant.

Further according to preferred embodiments of the present invention, the first polymeric composition is selected from the group consisting of: polylactic acid, polyglycolic acid, polyglactin, polydioxanone, polyglyconate, and all copolymers thereof. Still further according to preferred embodiments of the present invention, the second polymeric

composition is selected from the group consisting of: polylactic acid, polyglycolic acid, polyglactin, polydioxanone, polyglyconate, and all copolymers thereof.

It is appreciated that the aforementioned method is suitable for use in any surgery performed on a bone of the body wherein the wet bleeding environment in and around a hole formed in the bone makes placing an implant of the conventional type difficult. The implant and method of the present invention thus greatly improve the ease and convenience of a plurality of different surgeries and also raise the success rate and efficiency of said surgeries.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described, by way of example only, with reference to the accompanying drawings, wherein:

Figure 1 is a perspective side view of a dental implant having an integral abutment portion, according to certain preferred embodiments of the present invention.

Figure 2 is a cross sectional side view of the dental implant illustrated in Figure 1.

DETAILED DESCRIPTION OF THE DRAWINGS

It is appreciated that the detailed description provided is meant only to illustrate certain preferred embodiments of the present invention. It is in no way meant to limit the scope of the invention, as set out in the claims.

While the implant and method of the present invention will be described in detail with preferred embodiments that are specific to dental implants, it is to be appreciated that the present invention can be useful for any bone surgery, in orthopedics, bone reconstruction, the correction of birth defects, facial trauma, hip, knee, or shoulder replacement, etc...

Referring to Figure 1 in combination with Figure 2, the dental implant (3) of the present invention is unique, in one respect, since it has an integral abutment portion (7). In all dental implant systems of the prior art that are known to the inventor, the implant portion and the abutment have always been separate from one another. Among other advantages, having one implant/abutment structure allows for a significant simplification,

and a savings of both time and money, in the dental implant surgery. Moreover, another non-obvious and unique feature of the dental implant of the present invention is that the abutment portion (7) has a neck region (8) having bellowed flexible construction that allows the surgeon to easily set the angle of the abutment with respect to the implant for allowing for proper alignment of the dental prosthesis on top of the gum of the patient. The abutment portion is adapted for being manipulated so as to achieve angles of 0-25 degrees.

Now to describe the invention in detail, the dental implant (3) includes a bone portion (6) that is shaped and sized so as to fit into the root of the jawbone after a hole has been created in said bone. The outer surface (10) of the bone portion (6) is preferably non-smooth, so as to increase the surface area of said outer surface (10). In the preferred embodiment shown, the outer surface (10) of the bone portion (6) comprises a plurality of slots (11). The slots (11) may be rectangular, as shown, or they may have any other suitable construction for increasing the surface are of the bone portion. The slots preferably (11) extend around the entire circumference of the bone portion (6). More preferably, the outer surface (10) also comprises a plurality of small holes (15) extending from the outside of the bone portion (6) to the inner hollow cavity (9) of the implant, for allowing fluid communication between the interior and exterior of the implant.

The dental implant (3) further comprises an abutment portion (7). Said abutment portion (7) includes a bellowed bendable neck region (8) that is attached to the bone portion (6) of the implant (3). The bendable neck region (8) preferably includes a plurality of grooves (14) for bestowing on the abutment its flexible properties. The grooves (14) are preferably rectangular shaped, though it is appreciated that they may have other suitable configurations as well. In the preferred embodiment illustrated, the neck region (8) includes a first set of grooves (14), located on one side of the abutment, and a second set of grooves (14a), located on the second side of the abutment, each of said sets extending less than halfway around the circumference of the neck region (8). There may be any number of grooves on each side, in order to provide an appropriate degree of flexibility to the abutment. In the embodiment illustrated, the first set of grooves comprises two grooves and the second set of grooves comprises three grooves. It is appreciated that the design of the bellowed region may vary in different preferred

embodiments, but any suitable design that bestows the desired degree of flexibility to the abutment is acceptable. It is appreciated that in other applications of the present invention, where the implant is used for a bone other than the jawbone, varying degrees of flexibility will be required. Because of the unique construction of the implant of the present invention, the implant can be readily adapted for such applications.

The abutment portion (7) of the implant (3) further comprises a connector portion (12) for facilitating the connection between the abutment and a dental prosthesis. It is appreciated that the coupling between the abutment and the dental prosthesis may be accomplished through any suitable means known in the art. In the preferred embodiment illustrated, the connector portion (12) has a threaded bore (13) for allowing the prosthesis to be screwed into the implant. In other embodiments, for example, a ball-and-socket joint may be used. There are a wide variety of coupling means known in dentistry, as well as other areas of medicine benefiting from the implant design of the present invention, that could be employed.

In a preferred method for the usage of the dental implant of the present invention in dental restorative surgery, the surgeon firsts creates a hole of appropriate size into the bone of the patient. As an example only, the hole drilled may be about 3.5 millimeters in diameter. Next, the surgeon fills the hole with a predetermined amount of a first polymeric biocompatible osteointegrative composition. The surgeon then wets the bone portion of the implant with a predetermined activator, and inserts said bone portion (6) of the dental implant (3) into the hole drilled in the bone. Next, the surgeon manipulates the abutment portion (7) of the implant (3) so as to achieve the appropriate angle orientation in relationship to the neighboring teeth and the patient's mouth. Next, the inner hollow cavity (9) of the dental implant (3) is filled with a second polymeric, biocompatible composition. Finally, the temporary or permanent dental prosthesis is affixed on top of the implant via connection between the connector portion (12) of the abutment portion (7) and the prosthesis.

A variety of dental compositions are well-known in the art. For example, see U.S. Patent No. 4.097,935 to Jarcho, entitled, "Hydroxylapatite Ceramic." Any suitable compositions may be used in the method of the present invention. Surprisingly, the inventors of the present invention have discovered dental compositions that have highly

effective and osteo-integrative properties. These compositions include a polymer such as polyacrylic acid (specifically, poly(meta)acylic acid or PMA), and a filler (preferably HA) mixed together in known amounts. Additionally, the compositions comprise wetting agents selected from known acid polymers, such as polyoxalic, polylactic, polycitric, or all other polycarboxylic and polyaminic acids, or any suitable mixtures thereof. The use of poly-acids has been shown by the inventors to provide compositions with the best bone integration. The compositions also include suitable initiators. In synthesis of said compositions, the wetting agent(s) is first mixed with the HA, with the resulting mixture being combined with the polyacrylic acid.

In preferred embodiments of the present invention, the first and/or second polymeric composition is comprised of a reinforced *in situ* polymerizable material and hydroxyapatite. The polymerizable material preferably comprises a mixture of two monomers: 60%wt 1-methylethylidene bis[4,1-phenyleneoxy(2-hydroxy-3,1-propanediyl)] bis-methacrylate (bis-GMA) and 40%wt triethyleneglycol-dimethacrylate (TEGDMA). Benzoyl peroxide (BPO) (1%wt) and N,N-dimethyl-para-toluidine (N,N-DMPT) (1%wt) are the preferably initiator and room temperature activator, respectively. Hydroxyapatite (calcium phosphate hydroxide) is the preferably osteointegrative reinforcing component. The weight ratio between inorganic filler and the polymeric component was preferably 60%wt to 40% wt.

CLAIMS

1. An implant having an integral abutment for being implanted into a bone of the body comprising;

(a) a bone portion for being inserted into a bone of the body;

(b) an anchoring portion attached to said bone portion, said anchoring portion having a bendable neck region comprising a bellow-type construction;

wherein said implant further comprises an inner hollow cavity that extends through said bone portion and said anchoring portion.

2. An implant according to claim 1, wherein the bone portion has an outer surface, and wherein said outer surface is non-smooth.

3. An implant according to claim 2, wherein the bone portion has a plurality of holes extending from the exterior of the bone portion to said inner hollow cavity.

4. An implant according to claim 1, wherein the anchoring portion further comprises a connector portion adapted in construction for enabling fixation of a prosthesis onto said anchoring portion.

5. An implant according to claim 4, wherein the connector portion has a threaded internal bore.

6. An implant according to claim 1, wherein the bendable neck region comprises an outer surface, said outer surface comprising plurality of grooves.

7. An implant according to claim 1, comprised of stainless steel.

8. An implant according to claim 1, comprised of nitinol.

9. An implant according to claim 1, wherein the bendable neck region is adapted for being adjusted between to angles between 0-25 degrees with respect to the central vertical axis of said neck region.

10. An implant according to claim 1, wherein the bendable neck region is comprised of flexible stainless steel.

11. An implant according to claim 1, further comprising at least one drug incorporated therein.

12. An implant according to claim 11, wherein the drug is selected from the group consisting of: anti-inflammatory agents, antibacterial agents, antimycotic agents, antibiotics, and bone-regrowth stimulants.

13. A dental implant having an integral abutment portion, comprising;

(a) a bone portion, for being inserted into a hole in the jawbone of a patient;

(b) an abutment portion attached to said bone portion, said abutment portion having a bendable neck region comprising a bellow-type construction;

wherein said dental implant further comprises an inner hollow cavity that extends through said bone portion and said abutment portion.

14. A dental implant according to claim 13, wherein the bone portion has an outer surface, wherein said outer surface is non-smooth.

15. A dental implant according to claim 14, wherein the bone portion has a plurality of holes extending from said surface to said inner hollow cavity.

16. A dental implant according to claim 13, wherein the abutment portion further comprises a connector portion adapted in construction for enabling fixation of a dental prosthesis onto said abutment portion.

17. A dental implant according to claim 16, wherein the connector portion has a threaded internal bore.

18. A dental implant according to claim 13, further comprising a healing cap.

19. A dental implant according to claim 13, having an external diameter of approximately 3.20 millimeters.

20. A dental implant according to claim 13, having a length of approximately 16-20 millimeters.

21. A dental implant according to claim 13, wherein the bendable neck region comprises an outer surface, said outer surface comprising plurality of grooves.

22. A dental implant according to claim 13, comprised of stainless steel.

23. A dental implant according to claim 13, comprised of nitinol.

24. A dental implant according to claim 13, wherein the bendable neck region is adapted for being adjusted between to angles between 0-25 degrees with respect to the central vertical axis of said neck region.

25. A dental implant according to claim 13, wherein the bendable neck region is comprised of flexible stainless steel.

26. A dental implant according to claim 13, further comprising at least one drug incorporated therein.

27. A dental implant according to claim 26, wherein the drug is selected from the group consisting of: anti-inflammatory agents, antibacterial agents, antimycotic agents, antibiotics, gingival retraction agents, and bone regrowth stimulants.

28. A method for performing dental implant surgery, using a dental implant having an integral abutment, said dental implant comprised of a bone portion and an abutment portion having a bendable neck region attached to said bone portion, said bendable neck region having an accordion-type construction, wherein the dental implant further comprises an inner hollow cavity that extends through said bone portion and said abutment portion, the method comprising the steps of;

(a) forming a hole in the root of the mandible or maxilla bone of a patient;

(b) at least partially filling the root with a first polymeric, biocompatible, osteo-integrative composition;

(b) implanting the bone portion of the dental implant into the hole;

(c) bending the bendable neck region of the abutment portion of the dental implant so as to achieve the appropriate angular configuration;

(d) filling the inner hollow cavity with a second polymeric, biocompatible composition;

(e) affixing a temporary or permanent dental prosthesis to the dental implant.

29. A method according to claim 28, wherein the step of affixing comprises affixing the dental prosthesis into a threaded internal bore of the abutment portion.

30. A method according to claim 28, further comprising allowing the first composition to enter and fill at least part of the inner hollow cavity of the dental implant.

31. A method according to claim 28, wherein the first polymeric composition is selected from the group consisting of: polylactic acid, polyglycolic acid, polyglactin, polydioxanone, polyglyconate, and all copolymers thereof.

32. A method according to claim 28, wherein the second polymeric composition is selected from the group consisting of: polylactic acid, polyglycolic acid, polyglactin, polydioxanone, polyglyconate, and all copolymers thereof.

33. A method for performing implant surgery on a bone of the body, using an implant having an integral anchoring portion, said implant comprised of a bone portion and an anchoring portion having a bendable neck region attached to said bone portion, said

bendable neck region having an bellow-type construction, wherein the implant further comprises an inner hollow cavity that extends through said bone portion and said anchoring portion, the method comprising the steps of;

(a) forming a hole in a bone of the body;

(b) at least partially filling said hole with a first polymeric, biocompatible composition;

(c) implanting the bone portion of the implant into said hole;

(d) bending the bendable neck region of the anchoring portion of the implant so as to achieve the appropriate angular configuration;

(e) filling the inner hollow cavity with a second polymeric, biocompatible, composition;

(f) affixing a medical device or prosthesis to the implant.

34. A method according to claim 33, wherein the step of affixing comprises affixing the prosthesis into a threaded internal bore of the anchoring portion.

35. A method according to claim 33, further comprising allowing the first composition to enter and fill at least part of the inner hollow cavity of the implant.

36. A method according to claim 33, wherein the first polymeric composition is selected from the group consisting of: polylactic acid, polyglycolic acid, polyglactin, polydioxanone, polyglyconate, and all copolymers thereof.

37. A method according to claim 33, wherein the second polymeric composition is selected from the group consisting of: polylactic acid, polyglycolic acid, polyglactin, polydioxanone, polyglyconate, and all copolymers thereof.

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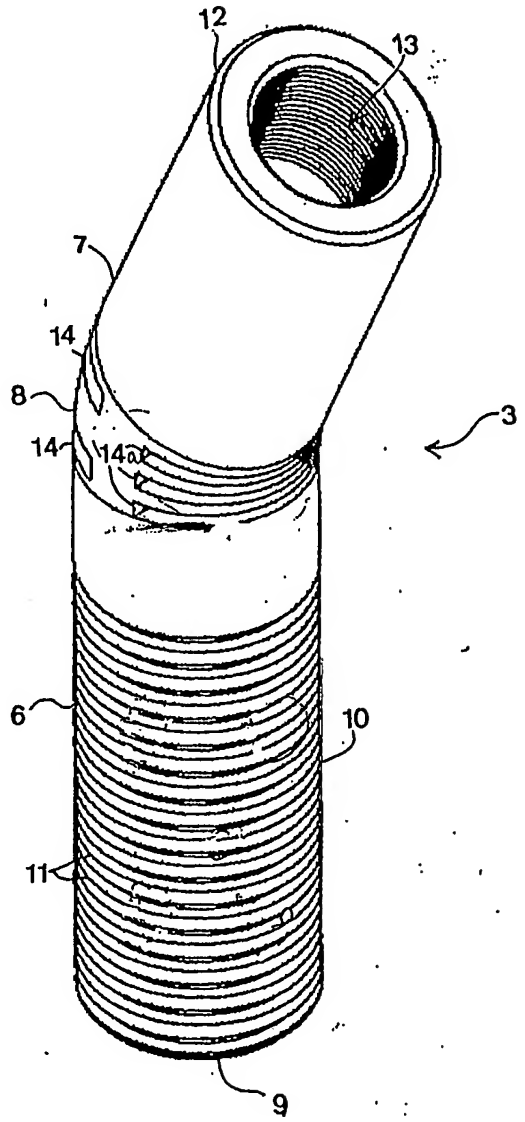
FIG. 1



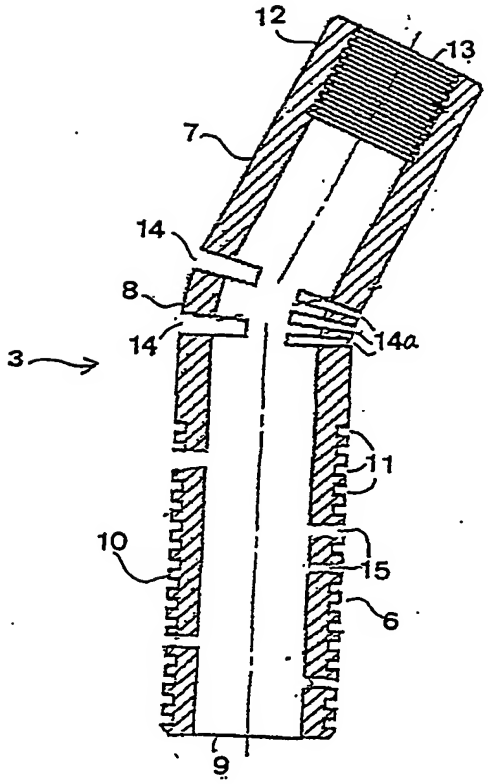


FIG. 2

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